200d Selective Catalytic Reduction of Nox with Nh3 over Cu-Zsm-5 – the Effect of Changing the Gas Composition

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The selective catalytic reduction of nitrogen oxides with ammonia over ZSM-5 catalysts has been studied with and without water vapour. The activity of H- Na- and Cu-ZSM-5 was compared and the results showed that the activity was greatly enhanced by the introduction of copper ions. A comparison between Cu-ZSM-5 of different silica to alumina ratios was also performed and the highest NO conversion was observed over the sample with the lowest silica to alumina ratio. Oxygen improves the activity at temperatures below 250ºC, but at higher temperatures O2 decreases the activity. The presence of water enhances the NO reduction, especially at high temperatures. Exposing the catalyst to equimolecular amounts of NO and NO2 increases the conversion of NOx, but the formation of N2O is increased. It is important to use about equal amounts of nitrogen oxides and ammonia at temperature below 250ºC to avoid ammonia slip and a blocking effect, but also to have high enough concentration to reduce the NOx. At higher temperatures higher ammonia concentrations result in additional NOx reduction since more ammonia becomes available for the NO reduction. At these higher temperatures ammonia oxidation increases so that there is no ammonia slip.